A Satyam Roychowdhury Initiative

EXPLORING THE IMPACT OF PLEASANT AND UNPLEASANT ODOUR ON EXECUTIVE FUNCTIONING AND STATE AND TRAIT ANGER ACROSS GENDERS IN KOLKATA

This dissertation is submitted for the partial fulfilment for the degree of

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CERTIFICATE

This is to certify that the dissertation titled "Exploring the impact of pleasant and unpleasant odour on executive functioning and state and trait anger across genders in Kolkata" submitted by Tiyas Bhattacharya, a 2nd year MSc student in Rehabilitation Psychology, Sister Nivedita University, is a Bonafide work, which may be placed before the board of examiners for their evaluation. This is partial fulfilment for the degree of MSc in Applied Psychology, Sister Nivedita University.

This is an original study done by the candidate and has not been submitted by her before any form for any other degree of this university or any other university.

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PLAGIARISM CERTIFICATE

"I,TIYAS BHATTACHARYA, hereby declare that the research work titled "Exploring the impact of pleasant and unpleasant odour on executive functioning and state and trait anger across genders in Kolkata", conducted by me, has been completed with full honesty and integrity. I confirm that the work is original, and all sources of information have been appropriately acknowledged and cited. Furthermore, I affirm that the research work has undergone through plagiarism check to ensure its authenticity. I take full responsibility for the content and findings presented in this research ."

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ABSTRACT

Introduction : Olfaction, sometimes known as the capacity to smell, is the chemical perception of gaseous odorants. This complex chemosensory process is carried out by the olfactory nerve (cranial nerve one), in conjunction with other neuroanatomical structures in the nasal passages, neurotransmitters, and the cerebral cortex.

The range of cognitive processes that regulate and keep an eye on particular cognitive abilities and actions is referred to as executive functions.

Anger is a typical, multifaceted emotion that may be linked to risk for damage as well as health and illness. It can be categorised as either trait anger, which is a feature of personality, or state anger, which is an outburst of rage that happens at a certain moment.

Aim : To explore the impact of pleasant and unpleasant odours on executive function and state and trait anger across genders in Kolkata .

Methods : An experimental pre-test and post-test control group design was used in the study, which involved 60 participants (30 male and 30 female) from Kolkata, aged 18 to 25 years. Two conditions were presented to the participants : control condition which consisted of no smell and experimental condition which consisted of one bad smell (turpentine) and one good smell (citrus) . The Stroop Effect Test was used to measure executive functioning, and the STAXI-2 was used to measure state and trait anger. The statistical analysis including Descriptive Statistics , Shapiro-Wilk Test for normality , Kruskal-Wallis, and Mann-Whitney U tests were done using Statistical Package For Social Sciences – 26 (SPSS – 26).

Results : The females consistently showed higher mean values for state, trait, and overall anger under all conditions. Executive function in unpleasant odour condition was more impaired in males. Executive functioning was improved in males by exposure to pleasant odour, while females had higher anger scores. Kruskal-Wallis analysis indicated that executive function alone was significantly impacted by smell conditions . Mann-Whitney tests indicated strong gender differences in trait and state anger under both odour conditions and in executive function when under the pleasant odour condition.

Conclusion : Olfactory stimuli, especially bad smells, can have a strong impact on executive functioning, and gender differences are pronounced in anger reactions. Pleasant smells can improve executive function in men but do not significantly decrease anger in women. These

results indicate a complex interaction between sensory input and cognitive-emotional regulation processes, moderated by gender.

Keywords : *Olfaction* , *Pleasant smell* , *Unpleasant smell* , *Executive functions* , *Anger* , *State Anger* , *Trait Anger* .

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INTRODUCTION

OLFACTORY FUNCTION

Olfaction, sometimes known as the capacity to smell, is the chemical perception of gaseous odorants. This complex chemosensory process is carried out by the olfactory nerve (cranial nerve one), in conjunction with other neuroanatomical structures in the nasal passages, neurotransmitters, and the cerebral cortex. From an evolutionary perspective, the ability to smell is essential for determining if ingested chemicals are safe, detecting danger, and identifying social ties. As people age, their perception and detection of instructions begin to deteriorate. In a clinical context, alterations in smell could be the first sign of the underlying disease and call for a comprehensive medical assessment.

The cribriform plate, a perforated section of the ethmoid bone that divides the nasal cavity from the frontal lobe of the cerebrum, is where the olfactory system is located at the roof of the nasal cavity. The primary cilia of olfactory sensory neurons are where odorant molecules initially come into contact with receptors in the nasal passageways. On these dendritic extensions, a single kind of protein receptor is expressed by each neuron. Individual odorants, however, have the ability to attach to a wide variety of receptor proteins. These first-order neurons dendritic terminals are surrounded by supportive epithelium and a thin layer of mucus. Bowman glands release a glycoprotein-rich serous fluid that retains, heats, and moistens air while aiding in the dissolution of gaseous odorant particles.

In humans, the olfactory system has several purposes. Smells are directly linked to memories and emotional experiences through their connections to the limbic system and cerebral cortex. Additionally, olfaction influences how animals behave and communicate with one another. Environmental odorants offer essential information for survival. Many species use smell to detect food sources, potential mates, poisons, predators, and danger.

When scent molecules reach our nose, they are channelled and swirled by bony projections called turbinate's , which is how odour perception starts. The olfactory epithelium, the portion of the nose that contains scent receptors, is situated far away in the top section of the nose and is well protected, making this a crucial function. Only about 10% of the air we breathe via our noses is thought to actually reach the olfactory epithelium. Odorant molecules must pass through a layer of watery mucus after they have reached the epithelium. Once there, they must

attach to hair-like cilia on the olfactory receptors. The signal is then sent from the nose's scent receptor up to the olfactory bulb by a series of biochemical events, which is an extremely elegant and complex process. Here, the signal is converted into an activation pattern that makes it possible to distinguish between the smells of pizza and roses.

Through the activation of two distinct sensory systems, each of which is able to detect and pick up chemicals in the air, many chemical compounds can produce two distinct responses in the nose. The olfactory system, the first system, is responsible for identifying odorous experiences, such as floral, fruity, musky, sulphurous, or rotten. Sensations of pungency or irritation are detected by the second sensory system, the trigeminal system. For example, excessive ammonia concentrations cause a tingling sensation in the nose and eyes in addition to an odour. Our brain has a tendency to combine two separate sensory systems into a single sense of ammonia, even when the odorant is stimulating both of them. To the best of our knowledge, trigeminal sensations can cause ocular and nasal symptoms (such as red eyes and a running nose), but smell sensations by themselves do not have a physiological effect. The sensory reactions happen in a predictable order as the odorant concentration rises. The smell is detectable but usually unidentifiable at low doses. Usually, an odorant's recognition threshold is three times higher than its detection threshold. An unpleasant smell will frequently cause irritation and/or intolerance as concentrations rise. An odorant doesn't have direct physical consequences unless its concentration rises above the point at which trigeminal or sensory irritants are activated. However, at concentrations well below the irritant threshold, people frequently report bodily symptoms and irritation. Understanding and distinguishing between subjective reports of perceived discomfort and actual irritation, also known as somatic irritation, which happens at higher doses, is a common focus of our research. The strength or hedonic character of a smell experience does not correspond with its hazardous potential, even if the presence of an odour is a marker of the presence of a chemical. The ability to smell a malodour does not necessarily indicate that it is present in a dangerous degree because numerous malodours can be detected in trace amounts.

Factors influencing olfactory functions :

- Age can be factor that affects olfactory functions , as aging can lead to reduced sensitivity towards smell .

- Genetic variations is also one of the factors that affect smell as there are various genetic diseases which affects the sense of smell .
- A common cold , sinusitis can also affect the sense of smell by temporarily blocking the nasal passages or damaging the olfactory neurons .
- Various neurological disorders including Alzheimer's , multiple sclerosis , Parkinson's can affect the function of the olfactory nerve .
- Long term exposure to chemicals , pollutants or smoke can damage the olfactory receptors .
- Head injury or injury to the nasal area due to an accident can also lead to anosmia which is loss of smell .
- Certain medications can also affect the olfactory functions .
- Structural obstruction such as nasal polyps or deviated septum can interfere with airflow or odour detection .

EXECUTIVE FUNCTIONS

The range of cognitive processes that regulate and keep an eye on particular cognitive abilities and actions is referred to as executive functions. The processes that give the human brain its distinct, well-organised, and complex structure are called executive functions, and they are found in the prefrontal cortex. The three primary executive functions of working memory, cognitive flexibility, and inhibitory control are widely acknowledged. Higher-order EFs like planning, reasoning, and problem-solving are developed from these.

INHIBITORY CONTROL - The ability to regulate one's attention, actions, thoughts, and emotions in order to overcome a strong internal tendency or an external lure and instead act in a more appropriate or necessary manner is known as inhibitory control, or inhibition. We can avoid embarrassing ourselves and show off our best qualities by having the foresight to wait before speaking or acting so that we respond thoughtfully rather than reflexively. The part of inhibitory control that deals with avoiding impulsive behaviour and restraining oneself from temptation is called self-control. The temptation may be to overindulge, stray from the straight and narrow (e.g., cheating or stealing), or engage in pleasures when one should not (e.g., eating sweets while one is attempting to lose weight).

Instead, you may be tempted to act impulsively (for example, automatically hitting back at someone who has offended you) or to do or take what you want without considering social conventions or other people's feelings (for example, butting in queue or taking another child's toy). There is some overlap between self-regulation and inhibitory control, but not all of it. Selective attention, also known as inhibitory control at the attention level, is the ability to maintain concentrate on your intended task in the face of distractions, such as distracting thoughts or environmental distractions.

The ability to maintain focus in the face of distractions and finish a task in spite of temptations to give up, switch to more engaging activity, or simply enjoy yourself is another facet of inhibitory control. This is forcing yourself to do or continue doing something even when you would rather to be doing something else. It has to do with the last component of self-control, which is delaying gratification, which is giving up an instant pleasure in favour of a bigger benefit later. No one would ever finish a lengthy, time-consuming endeavour like writing a term paper, a dissertation, or a marathon if they had the discipline to finish what they started and postpone satisfaction. We would be at the mercy of impulse, ingrained thought or behaviour patterns, and environmental cues that nudge us in different directions if we lacked inhibitory control. Therefore, rather than being mindless creatures of habit, inhibitory control enables us to alter and choose how we respond and behave. It is not made simple by it. Indeed, we are usually creatures of habit and our behaviour is under the control of environmental stimuli far more than we usually realize, but having the ability to exercise inhibitory control creates the possibility of choice and change.

WORKING MEMORY - Working memory is the ability to retain and manipulate information in the mind. Working memory is necessary when converting instructions into action plans, changing your planning or thinking, mentally rearranging a to-do list, weighing your options, or connecting one piece of information to another. Making meaning of anything that happens throughout time always demands remembering the past and connecting it to the present, which is why working memory is so important. Making sense of spoken or written language, whether it be a sentence, paragraph, or more, so requires working memory.

Since what was previously spoken is no longer physically present, it is necessary to employ working memory to relate it to what you are currently hearing. This is why oral language is so evidently in need of working memory . Even at the sentence level, it is uncommon to see every word at once, therefore word recognition is also essential for comprehension. We use working

memory to connect what we have read so far to what we are currently reading. Without working memory, reasoning would not be feasible. Working memory is essential for mentally connecting data in order to arrive at a general principle, recognise connections between objects or concepts, or weigh options.

Because creativity entails dismantling and recombining materials in novel ways, working memory is essential to our capacity to recognise connections between seemingly unrelated items and to separate components from an integrated whole. Additionally, working memory allows us to use conceptual knowledge rather than merely perceptual input in our decision-making process, taking into account our memories of the past and our aspirations for the future. Short-term memory (merely storing information in memory) is not the same as working memory , which involves both storing and modifying information. They exhibit distinct developmental progressions (short-term memory develops earlier and faster) and are associated with distinct brain subsystems.

COGNITIVE FLEXIBILITY - Cognitive flexibility appears much later in development and builds upon the other two. Cognitive flexibility is the ability to shift viewpoints, either interpersonally (e.g., "Let me see if I can see this issue from your perspective.") or spatially (e.g., "How would this look if viewed from a different direction?"). In order to switch views, we must load a new perspective into working memory (i.e., activate a new perspective) and inhibit (de-activate) our old perspective. In this way, cognitive flexibility depends on and enhances working memory and inhibitory control.

Thinking outside the box, or altering our perspective, is another facet of cognitive flexibility. For instance, we can employ cognitive flexibility to try to think of a different approach to the problem if one method of tackling it isn't working. Additionally, cognitive flexibility includes the ability to adapt to shifting priorities or demands, seize unexpected opportunities, solve unforeseen challenges, or even own up to mistakes when new information becomes available.

Executive Function refers to the higher order cognitive control processes that influence and direct thoughts and cognitive processes. These include the ability to flexibly shift between tasks, inhibit thoughts or responses to external stimuli, and update working memory with relevant information.

Factors influencing executive functioning :

- The emotional factors that affect executive functioning include emotional liability , depression , anxiety and irritability .
- The inability of a person to perform any task after a traumatic brain injury can lead to the rise of another one of the factors that affect executive functioning which is frustration .
- Sleep disturbance and fatigue due to extreme pressure at work or at home can also affect an individuals executive functioning .
- Executive functioning can also be affected by physical health issues including infection, dehydration, nutritional deficiencies, endocrine problems, sodium balance.
- Cognitive problems including disorientation and confusion also affect executive functioning .
- Boredom arising from the inability to initiate self directed activity, apathy and reduced motivation. Frequently there is a lack of a normal range of opportunities to engage in activity within hospital, rehabilitation and care settings.
- Environmental factors including noise, high levels of stimulation, temperature, living with other people with brain injuries affect the executive functioning ability .
- Inability of an individual to leave their home and being couped up all around the year can also affect an individuals cognitive ability .
- Carer approach. A particular type of approach may work well with one brain injured person but not with another. Lack of a consistent approach to the management of care procedures may result in anxiety, confusion, distress and potentially challenging behaviour.
- Some basic everyday tasks, communicative and cognitive demands may be challenging for the person, often leading to them feeling overwhelmed, stressed and anxious.

A series of top-down cognitive processes necessary for goal-directed activities is referred to as executive functions , also known as cognitive control. Actively maintaining goal presentations and the strategies to reach them is a component of these higher-order cognitive processes. Various information processing methods, sensory modalities (such as visual and auditory), and systems in charge of response execution, memory update and retrieval, and emotional

assessment are all engaged in this process. As a result, executive functions engage many different brain regions and processes.

Cognitive, social, and psychological development, mental and physical health, and behaviour adaptation and regulation all depend on these higher-order cognitive processes. Executive dysfunctions, also known as executive function deficits, are frequently seen in people with mental and psychiatric illnesses. Rather than being associated with specific areas of cognition, it is crucial to view executive function as a meta-cognitive, supervisory, or governing mechanism. However, executive function are frequently explained in terms of particular cognitive or information processing processes. Although the prefrontal cortex has historically been associated with executive functions, the anterior and posterior cingulate cortices also play a significant role in these processes.

Some of the famous theories and observations on executive functioning has been provided by:

Adele Diamond

One of the leading authorities on executive function, particularly in children, is Adele Diamond. According to her, controlling our emotions and behaviour in addition to surviving school or the workplace are one of our duties . According to Diamond's research, engaging in outdoor play and even arts and crafts can strengthen our executive functions. She thinks that brain-challenging activities are essential for assisting children in developing these abilities at a young age.

Miyake Akira and Naomi P. Friedman

A more scientific perspective is provided by Naomi P. Friedman and Miyake Akira. They divided executive functions into three primary categories: switching between tasks, utilising and updating new information, and preventing impulsive actions. Their research is valuable because it clarifies that executive function is a collection of critical abilities that aid in navigating life, rather than a single concept.

Guare and Dawson

Guare and Dawson demonstrate how executive functions impact daily chores and accomplishments by bringing them into the real world. They are renowned for developing

methods that assist individuals in enhancing their executive functioning in day-to-day situations. The work of Guare and Dawson is incredibly useful, providing strategies and resources for improved goal-setting, time management, and organisation. Everyone can benefit from the science of executive functions thanks to their methodology.

ANGER

Anger is a typical, multifaceted emotion that may be linked to risk for damage as well as health and illness. It can be categorised as either trait anger, which is a feature of personality, or state anger, which is an outburst of rage that happens at a certain moment.

Every living thing, every historical period, and every community has anger, albeit in diverse forms and manifestations. Even when concentrating on specific manifestations of anger, independent of social, familial, or historical factors, the complexity of this emotion becomes apparent. Anger is really supported and modulated by a number of factors, including arousal, cognition, anger control, and physiological and behavioural manifestation. Furthermore, a number of networks are triggered when anger is generated, including the self-referential mentalizing network, the salience network danger detection, the habit network automatic approach, and the self-regulation network reaction evaluation selection. Perhaps because of this intricacy, there isn't a universally accepted definition of rage or a set of standards for distinguishing between pathological and healthy manifestations. Regarding the definition, numerous recommendations have been made.

In summary, anger can be defined as an emotional state of varying intensity that is "related to but conceptually separable from behaviour associated." It is also accompanied by physiological activation, such as tension in the muscles, the autonomic nervous system, and the neuroendocrine system, as well as cognitive elaborations and coping mechanisms. Forms of antagonism, sensitivity to threats or challenges, destructive fantasies, aggressive planning, or thoughts of persecution are frequently linked to anger, as are certain cognitive and perceptual deficits and distortions (e.g., misappraisals, errors, and attributions of blame, injustice, preventability).

Anger can be used to control fear (lessen security risks) or to boost a sense of joy from controlling others since it can be driven by both a need for dominance and a need for security.

Additionally, there are variations in the meaning of rage. According to Novaco and Welsh, rage is an emotion that is not a pathological state in and of itself, even though it is unpleasant for the person experiencing it. In contrast, anxiety and sadness are clinical illnesses. Although anger may raise the likelihood of violent action, it may also be a source of strength, encouraging people to stand up for themselves. Thus, anger can be interpreted in both positive and negative ways.

Divergent opinions exist regarding how anger should be expressed. The catharsis idea states that expressing anger is beneficial since it makes one's mood better. Because rage restores a more acceptable welfare trade-off ratio, the recalibration hypothesis also acknowledges anger's adaptive purpose. According to other studies, rumination exacerbated rather than lessened hostility and rage. Anger venting was less helpful than doing nothing at all. For others, expressing or suppressing anger is neither wholly beneficial nor detrimental.

With the exception of disruptive mood dysregulation disorder, the DSM-5 does not include anger disorders, which is consistent with the pathological manifestations of anger. For a rough screening, the criterion that anger reactions "become clinical problems when they are too frequent, too intense, or endure too long" may be helpful, but it is insufficient for a clinical evaluation. We currently lack a recognised taxonomy of anger and aggressiveness issues that guides treatment research, as Lee and DiGiuseppe contend.

Among the theories on anger are Charles Donald Spielberger (1927–2013) created the State-Trait Anger Theory, a psychological theory that looks at the characteristics and dynamics of anger. All people have similar affective experiences, such as anger. Emotion is a vital survival strategy to defend against dangers. "Normally, emotions like anxiety and anger...pain and joy interact to motivate a person to a goal directed action," according to Spielberger (Spielberger & Reheiser, 2009). But not every feeling is suitable in every circumstance. Disruptive emotional events are linked to a number of diseases. Many people's lives are ruined by mood disorders, which are prevalent and disruptive.

Factors influencing anger :

- Genetic factors , brain structures (e.g., amygdala, prefrontal cortex), and neurotransmitters (e.g., serotonin, dopamine) play a role in regulating aggression.

- Higher levels of testosterone and lower levels of cortisol are found to be associated with increased aggression.
- Traits like impulsivity, low frustration tolerance, and high neuroticism can be a contributing factor to aggressive behaviour.
- Stressful or violent environments, exposure to aggressive role models, and early childhood experiences shape aggression.
- Societal acceptance of aggression, cultural values, and peer influences impact aggressive tendencies.
- Mental health conditions like intermittent explosive disorder, anxiety, or depression can increase aggression.
- Alcohol and drug use lower inhibitions and impair judgment, leading to aggressive behaviours.

LITERATURE REVIEW

The chapter represents a comprehensive review of existing literature in order to find a relationship between the variables .

Studies on Olfaction

Researches such as Linda B. Buck , Fred Hutchinson (December 8, 2004) have noted that the olfactory system, which mediates the sensation of smell, is distinguished by its exceptional sensitivity and capacity for discrimination. The perceived scent of an odorant can be altered by even minor structural changes. A molecule that is closely related to a pear, for instance, can smell like an apple. Olfactory sensory neurones, which are found in the olfactory epithelium lining the nasal cavity, are the first to detect odorants. The brain's olfactory bulb receives messages from these neurones and forwards them to the olfactory cortex. Numerous other parts of the brain receive the information after that. These include deep limbic regions of the brain, which are believed to influence the emotional and physiological impacts of odours, and upper cortical areas, which are assumed to be involved in odour discrimination.

Researchers Dana Sisdikarini , Endah Sulistiawati , Dhias Cahya (August , 2024) noted that Turpentine oil, sometimes referred to as spirits of turpentine, is a colourless liquid that evaporates quickly and has a strong, pungent odour . It is made by distilling pine sap which is highly combustible. Pine resin contains between 10 and 17.5% turpentine oil, with fresh sap yielding a larger amount. Pinus merkusii is the species of pine tree that is most commonly grown in Indonesia. Turpentine oil has long been used as a thinner solvent for paint, metal polish, and printing ink. Due to its high value and financial advantages, it is now also utilised as an addition in the pharmaceutical, insect repellent, antifungal and disinfectant industries.

Researchers such as Pooja Agarwal et al (November , 2022) noted that the Citrus essential oil has been used in aromatherapy as a therapeutic approach since a long time . By regulating circulation through the autonomic nervous system, citrus essential oils are aromatic volatile molecules that, when inhaled, can change haemodynamic parameters or blood flow in the body. The antibacterial and antioxidant properties of citrus essential oils have also been studied. Numerous citrus essential oils, including orange and bitter orange, have been demonstrated to have sedative, analgesic, depressive, anticonvulsant, and anxiolytic properties. They also have

an impact on general emotional behaviour. Bioactive substances including limonene, β-pinene, γ-terpinene, aldehydes, ketones, esters, alcohols, and monoterpenes and their derivatives are important constituents of citrus essential oils.

Researchers such as Ivan E. de Araujo , Edmund T. Rolls , Edmund rolls , Maria Inés Velazco, Christian Margot , Isabelle Cayeux (May 2005) noted that the hedonic or affective component of odour perception is a key characteristic. The majority of smells are classified as either "pleasant" (positive hedonic value) or "unpleasant" (negative hedonic value). Recent human functional neuroimaging investigations have effectively shown that the orbitofrontal cortex is specifically responsible for representing the valence of odours. In particular, unpleasant smells engage more lateral regions, while pleasant smells preferentially activate medial orbitofrontal regions (Anderson et al., 2003; Gottfried et al., 2002; Rolls et al., 2003; Zald and Pardo, 1997). Furthermore, the representation of odour strength has been linked to activity in the amygdala (Anderson et al., 2003) and piriform (primary olfactory) cortex (Rolls et al., 2003). Gottfried and Dolan (2003) demonstrated in a recent study that perceptual olfactory facilitation, which is induced by presenting people with odours matched with semantically relevant pictures, is connected with activity in the human anterior hippocampus and medial orbitofrontal cortex. Royet et al. (1999) demonstrated in a previous positron emission tomography (PET) study that familiarity judgements were linked to activations in the anterior cingulate and right orbitofrontal cortices. According to Zatorre et al. (2000), hedonic evaluations of a collection of scents were associated with orbitofrontal brain activation.

Researchers such as David.E.Vance et al (February 2023) noted that there may be a dynamic neuronal link between smell and cognition, according to research. Overall, there is growing evidence from the reviewed studies that Olfactory Training is linked to better global cognition, namely verbal learning/memory and verbal fluency. Increases in the size and volume of olfactory-related brain areas, including as the hippocampus and olfactory bulb, as well as changes in functional connections are also linked to olfactory training. It's interesting to note that normosmic (i.e., having a normal ability to smell) participants also benefited from these favourable benefits, rather than just those with smell loss (i.e., hyposmia & anosmia).

Researchers such as Howard Ehrlichman & Linda Bastone (1992) noted that in both popular and scholarly studies of the sense of smell, it is now widely accepted that olfaction and emotion are strongly related. It is claimed that smells have the ability to affect mood, arouse strong feelings of pleasure or annoyance, induce vigilance or relaxation, and bring back emotional memories that have long been forgotten. These effects are frequently attributed to olfactory dependence on emotional experience-related brain regions.

Researchers such as Johan Willander and Maria Larsson (October , 2007) noted that memories induced by verbal and visual information are not the same as those produced by olfactory information . Verbal cueing of memories, for instance, has been shown to produce a memory bump between the ages of 10 and 30 at the time of the incident . Olfactory cued memories, on the other hand, have been localised to the first decade of life, demonstrating that odour representations are older than verbal and visual ones, in contrast to a memory peak in young adulthood . An advantage of odour's as cues to emotional autobiographical memories may be a result of participants evaluating the olfactory cue rather than the retrieved memory. The underlying assumption for the advantage of odour's as cues to emotional memories is the direct synapsing from the olfactory areas to the amygdala–hippocampal complex, the neuronal substrate of emotional memory . Because passive smelling of odours may influence the emotional arousal in individuals , without memory recollection, it is of interest to investigate the role played by olfactory perception in the recollection and phenomenological evaluation of retrieved memories .

Researchers such as Ute Wallrabeck-Dworschak, Thomas Hummel noted that positive or bad emotions are strongly associated with odours; when an odour is detected, this relationship is recalled from memory. Memories and thoughts of loved ones are evoked by odours. As a result, those who lose their ability to smell may experience social isolation and insecurity. Since they can't smell themselves, other problems might be related to personal hygiene. Patients with scent abnormalities have a lower quality of life and are more likely to experience psychological issues, including depressive symptoms . It's interesting to note that patients with phantosmia or parosmia have an even worse quality of life.

Researcher Robert A. Baron (June, 2010) conducted a study on forty-eight male undergraduates to investigate the effects of pleasant scents on physical aggression The subjects were given the chance to act aggressively towards a male or female confederate after they had initially been enraged or not. In the presence of a very pleasant aroma (perfume), one third became aggressive, and in the presence of a somewhat pleasant scent, another third became aggressed without presence of any aroma . The findings showed that, for male victims, the presence of perfume increased aggression if the subjects had previously been enraged, but decreased aggression if they had not been provoked. In contrast, for female victims, the presence of perfume increased aggression regardless of whether the subjects had previously been enraged.

Researchers Matthias Hoenen , Oliver T. Wolf, and Bettina M. Pause noted that the emotional and olfactory systems have similar neural architecture and are strongly intertwined. This study examines the relationship between odour identification skill and hedonic odour judgements (intensity, pleasantness, and unpleasantness) and physiological (saliva cortisol) stress reactions, such as anger and fear. Nineteen men took part in a control session and the modified Trier Social Stress Test (TSST). Both sessions had comparable levels of physiological arousal. The University of Pennsylvania Smell recognition Test was used to evaluate the participants' odour recognition score during each session, while the variables of valence, arousal, anger, and anxiety were used to document their fleeting mood. However, worse odour identification performance is linked to higher levels of anger during the TSST session (in contrast to the control session). The study demonstrates that the physiological and emotional stress reactions have different consequences, showing that higher cortisol levels are linked to better odour identification ability while higher anger levels are linked to worse odour identification performance.

Studies on Executive Functioning

Researchers Sandra A. Wiebe & Julia Karbach noted that executive functioning is a group of higher-order cognitive processes involved in controlling thoughts, behaviours, and attention. Executive functioning is intimately associated with the prefrontal cortex, a top-down control region that "is critical in situations where the mappings between sensory inputs, thoughts, and actions either are rapidly changing or are weakly established relative to other existing ones." A

wide range of activities, including response inhibition, working memory updating, attention shifting, goal monitoring, and action planning, are included in the numerous models of Executive functioning that have been put forth. Over the course of life, the structure of Executive functioning varies, growing increasingly complex during childhood and adolescence and then decreasing in late age.

Researchers Vasudeva Murthy Challakere Ramaswamy , Peter William Schofield noted that there are many objective tests of olfaction that can be used to help evaluate olfaction. Characterising olfactory changes that a patient reports or suspects is their most obvious function. The body of research on the correlation between olfactory abnormalities and certain neuropsychiatric disorders is expanding quickly, and the application of olfactory testing to enhance traditional evaluations in clinical and research settings is developing. Many of the neural circuits involved in executive functioning, which are mostly located in the frontal lobes, overlap significantly with those involved in olfactory processing and cognitive performance.

Researchers Ana.B Fagundo noted that both executive functions and smell seem are linked to the prefrontal and orbitofrontal cortex. However, there is a dearth of information about human executive processes and olfactory processing. The current study distinguished between the primary and more cognitive elements of olfaction in order to investigate the impact of olfaction on executive performance. Three executive tasks with comparable levels of difficulty were employed. The Iowa Gambling Task (IGT) was used to evaluate hot executive functioning, and the Stroop Colour and Word Test (SCWT) and the Wisconsin Card Sorting Test (WCST) were utilised to test cool executive functioning. There were sixty-two healthy volunteers, thirty-one of whom had normosmia and thirty-one of whom had hyposmia. The "Sniffin' Sticks" test was used to evaluate olfactory abilities, and measurements of olfactory threshold, smell discrimination, and scent recognition were acquired. Every participant was female and ranged in age from 18 to 60. The findings indicated that individuals with hyposmia performed worse than those with normosmia in terms of cognitive flexibility and decision-making. Odour identification and the cognitive inhibitory response were positively correlated, according to multiple regression adjusted by the factors of participants' age and educational attainment. Cognitive executive performance was not predicted by odour discriminating ability. Our findings imply that higher-order olfactory functioning in humans appears to be linked to both hot and cold executive processes.

According to Ogilvie et al. (2011), executive functions are cognitive, emotional, and motivational processes that are crucial for behaviour regulation, the development of adaptive behaviours, and the promotion of social integration. Executive functions are made up of cognitive processes that allow for control, self-regulation of behaviour, processing speed, working memory, verbal fluency, inhibition, dual execution, cognitive flexibility, planning, and decision making, according to a systematic review (Tirapu-Ustárroz et al., 2017) that examined 33 studies. In particular, there is proof that changes in these functions result in behavioural and cognitive symptoms that impede people's ability to function and adjust to social situations (Arioli et al., 2020; Cruz et al., 2020). Understanding the molecular underpinnings of social behaviour has been aided by neuropsychology (Arioli et al., 2020). According to a meta-analysis (Ogilvie et al., 2011) that examined 126 research with 14,786 cases, those who engage in antisocial behaviour had more executive function impairments than healthy controls . The groups with externalising behaviour disorders, antisocial personality disorders, and antisocial behaviours showed the most changes in this comparison. Accordingly, some research has shown that individuals with executive function abnormalities who have been convicted of violent crimes also report higher levels of aggression, while other research suggests that executive function abnormalities are linked to social skills, impulsivity, judgement, and foresight (Karlsson et al., 2016; Meijers et al., 2017; Cruz et al., 2020) .

Researcher Sarah . R. Holley et al has noted that that deficiencies in executive functioning and emotion management make people more prone to acting aggressively. However, there hasn't been any assessment of how these risk variables affect each other. In a sample of 168 undergraduate students, this study assessed the extent to which each was linked to aggressive behaviours. The Stroop-like neuropsychological task was used to evaluate executive functioning, which includes mental flexibility and cognitive inhibition. Self-report questionnaires were used to evaluate aggressive behaviours and emotional control. The findings revealed a substantial interaction between the major effects for executive functioning and emotion regulation, showing that the most frequent aggressive behaviours were reported by those with the lowest scores in both areas. This connection was only significant for physical aggression, not verbal aggression, when diverse forms of aggressiveness were analysed. As a result, executive functioning and emotion regulation had a moderating effect on physical violence. The consequence is that relatively good capabilities in either domain may operate as

a barrier against inclinations to engage in violent behaviours, at least when it comes to physical aggressiveness. Therefore, executive functioning skills and emotion control skills could both be useful targets for therapies meant to lessen violent behaviours.

Executive function (EF) is a multidimensional term that encompasses a range of high-level cognitive abilities (De Frias, Dixon, & Strauss, 2006). For the majority of the last century, investigations of executive functioning stemmed from neuropsychological research on adults with frontal lobe injury (Stuss & Benson, 1986). These investigations found that lesions in the prefrontal cortex are associated with difficulty in tasks requiring impulse control, strategic planning, and behaviour inhibition (Luria, 1972). Over time, significant characteristics of executive functions have been recognised, including inhibitory control, attention shifting, working memory, goal-directed behaviour, and strategic planning (Barkley, 1997; Miyake et al., 2000; Zelazo & Müller, 2002).

Researcher Alfredo Ardila noted that The prefrontal lobe is involved in two closely related but distinct executive function abilities: (1) "metacognitive executive functions": problem solving, planning, concept formation, strategy development and implementation, controlling attention, working memory, and the like; that is, executive functions as they are usually understood in contemporary neuroscience; and (2) "emotional/motivational executive functions": coordinating cognition and emotion/motivation (The first is based on dorsolateral prefrontal areas, whereas the second is linked to orbitofrontal and medial frontal areas. Current executive function tests mostly assess the first ability (metacognition). The second capacity (emotional/motivational) is primarily required while solving everyday difficulties (functional use of executive functions).

Researchers Denise Chen, Pamela Dalton noted a comprehensive investigation to investigate how the emotional tone of the stimuli, as well as the individual's personality and current emotional state, influence olfactory perception. When exposed to similar emotionally themed video clips, subjects reported feelings of happiness, sadness, negativity/hostility, and neutrality, as well as the scent of a suprathreshold pleasant, unpleasant, and neutral odorant. The subject's detection time for each odorant, as well as their olfactory intensity, were recorded. We discovered that women smell the pleasant odorant sooner than the neutral one.

Furthermore, personality influenced reaction time and olfactory intensity, so neurotic and anxious people were more likely to prefer affective odorants over neutral ones. Finally, current emotional state increased intensity in males but not in women and had a different effect on response time. These findings shed new light on the influence of mood and personality on smell perception.

Researchers Holly James Westervelt et al noted that the link between odour recognition and cognition has not previously been clearly understood. The neuroanatomy of the olfactory system, as well as the prevalence of olfactory dysfunction in neurodegenerative diseases, point to a possible link between odour identification and memory, language, and executive functioning, though previous research has frequently failed to show this link. The current study looked at this association across a range of competence levels (n=100). The strongest connections were discovered between odour identification and language, most components of memory, and a measure of overall cognitive performance. Significant but minor associations were discovered between odour recognition and attention, motor, visuospatial, and executive functioning. A regression analysis found that language is the sole significant predictor of olfactory performance. These data indicate that odour identification is most closely related to other measures of temporal-limbic functioning. The ramifications of these findings, particularly in terms of assessing older persons, are explored.

Researchers Margareta Hedner noted that determining the cognitive correlates of olfactory performance across three distinct tasks was the aim of this investigation. 170 men and women (30–87 years old) were evaluated in terms of identification, discrimination, and olfactory sensitivity. A variety of cognitive tests encompassing executive functioning, semantic memory, and episodic memory were also administered to the subjects. While all of the cognitive characteristics were shown to be unrelated to performance on the odour threshold test, hierarchical regression analyses revealed that executive functioning and semantic memory skills strongly influenced odour discrimination and identification performance. This pattern of results implies that performance in higher order olfactory tasks is reliably influenced by an individual's cognitive profile.

Studies on Anger

Researchers Sima Noohi et al noted that emotions are a social phenomenon that are biological, goal-directed, and subjective. Innate events are those that happen in various people under identical conditions, are rarely influenced by cultural and educational contexts, and elicit specific physiological reactions. Angry feelings are among the basic human emotions. Anger can vary from a fleeting annoyance to a full-blown outburst. Nonetheless, it is regarded as a normal occurrence and, like other emotions and sentiments, is an indication of human affect, cleanliness, and mental health. Since anger provides a means for a person to express their negative emotions, it could be viewed as desirable. Furthermore, it is the fundamental theme of many acts of bravery and valour in combat and in military contexts. However, excessive anger leads to a lot of issues. Anger-related blood pressure and other physiological changes impair mental and physical health and make thinking and decision-making challenging . Despite popular belief, rage is a normal emotion that is transcendental and universal rather than merely a bad emotion like hostility and aggressiveness.

Interpersonal relationships are the source of anger, which is felt when a person's intentions, wants, and needs are not met and when he believes that the situation is unjust and a threat to his ego (Averill, 1983; Bıyık , 2004; Eisenberg & Delaney, 1998; Kısaç , 1997). Anger comes in two flavours: characteristic anger and transient anger. Temporary anger is triggered by certain circumstances, and its intensity fluctuates based on how much the person feels attacked, unfairly treated, or frustrated. Conversely, trait anger is characterised by a propensity to experience more frequent, transient anger and is defined as viewing many circumstances or surroundings as dull or aggravating (Deff enbacher et al., 1996; Spielberger, 1991; Spielberger, Jacobs, Russell, & Crane, 1983). The way that rage is conveyed affects how it feels. Anger-in, anger-out, and anger-control are the three ways that people can express their anger. While anger-out is expressed verbally by cursing or criticising, or physically by beating and injuring items, anger-in refers to suppressing anger and not expressing it. Having a general propensity to act in a calm, understanding, patient, and tolerant manner is known as anger control. The fact that a person experiences stress as a result of the scenario is another factor contributing to their feelings of rage. It was discovered that a person's display of anger and the level of anger they experience are linked to high levels of stress (Diong et al., 2005; Diong & Bishop, 1999).

Researcher Smiljana Mutic et al (January,2016)noted that a high survival benefit is the capacity to identify conspecifics that could pose a threat to an individual. Humans use all

sensory modalities, including the chemosensory systems, to convey information that is relevant to social interactions. In study 1, we examined whether a stranger's body odour can be used as a chemosignal of hostility when they want to cause damage. During an ergometer session (exercise chemosignal) and a boxing session that involved aggressiveness-inducing techniques (chemosignal of aggression), sixteen healthy male participants gave their body odour. Following aggression induction, there was a selective increase in self-reports of anger, aggression-related physical activity, and motivation to hurt. In study 2, we investigated whether emotional reciprocity (such as fear) or emotional contagion (such as fury) occur in receivers who scent such chemosignals . In order to assess affective/cognitive processing (i.e., emotion recognition task, emotional stroop test), 22 healthy normosmic adults were exposed to the aggressiveness and exercise chemosignals in a double-blind, randomised exposure. According to behavioural data, recipients of aggressive chemosignals experience an affective/cognitive modulation that is consistent with an anxiety reaction. These results are explored in the context of emotional reciprocity mechanisms, which are a means of communicating motivational and affective information to humans through chemosensory signals.

Researchers Yuliya Richard et al noted that aggression and anger have a significant negative influence on both individual safety and society as a whole. Understanding the neurological and cognitive components of rage and aggression is crucial for developing an intervention that reduces violent actions. The cognitive and neurological components of anger-related processes, such as anger-related actions and anger reduction, are examined in this comprehensive review. With this knowledge in hand, we then examine earlier approaches to treating anger-related problems and managing anger, such as cognitive behavioural therapy and mindfulness. We explore how anger is linked to impulsivity and increased attention to anger-related stimuli at the cognitive level. Anger is linked to aberrant activity of the ventromedial prefrontal cortex and amygdala at the neurological level. In conclusion, we contend that mindfulness-based cognitive behavioural therapy may be more effective than other behavioural treatments, such as mindfulness alone or cognitive behavioural therapy, at lowering anger and aggressiveness. This is supported by cognitive and neurological research. We offer important details about upcoming studies and the most effective strategies for controlling rage and lowering violence. Crucially, future studies should look into how stress affects the development of rage and how anger-related behaviours are learnt.

Researchers Croy Ilona et al noted that Olfaction is frequently associated with emotional processing. Olfactory signals frequently recall memories with a high emotional weight. On the

other hand, basic negative or positive emotional states should be adequate to cover the most important activities of the olfactory system, such as ingesting, hazard avoidance, and social communication. Thus, we tested whether distinct basic emotions may be elicited in healthy adults by olfaction. We asked 119 people which odour generates one of the six main emotions (happiness, disgust, anger, anxiety, sadness, and surprise), and another 97 participants were questioned about images that evoke same emotions. The findings revealed that nearly every participant could identify an aroma elicitor for happiness or disgust. Although olfactory elicitors of anxiety were reported less frequently, three-quarters of subjects did so. However, for grief and anger, only around half of the subjects mentioned an olfactory elicitor, whereas significantly more mentioned a visual signal. Olfactory emotion elicitors were primarily associated with the classes of culture, plants, and food, whereas visual emotion elicitors were predominantly associated with humans. This evidence lends support to the concept that the great majority of people can generate few distinct emotions via the olfactory channel. These emotions include happiness, disgust, and anxiety.

Anger is a complex emotion that affects subjective experience, behaviour, and both central and peripheral responses (Gross & Thompson, 2007; Mauss et al., 2005). Emotions have a crucial role in planning behavioural responses, enabling interpersonal interactions, and enhancing memory for relevant events (Gross & Thompson, 2007). Emotions originate in the subcortical limbic system, which includes the amygdala and hippocampus (Williams, Suchy, & Rau, 2009). Anger is a common and easily recognised emotion. According to Averill (1982), the majority of people experience anger on a daily or weekly basis. According to Lerner and Tiedens (2006), furious persons are viewed as competent, dominating, and dangerous due to their ability to capture attention through facial expressions.

METHODS:

- **AIM OF THE RESEARCH :** To explore the impact of pleasant and unpleasant odours on executive function and state and trait anger across genders .
- **OBJECTIVES :**
  1. To asses the impact of pleasant and unpleasant odours on executive function in young adults .
  2. To assess the impact of pleasant and unpleasant odours on state and trait anger in young adults.
  3. To assess the difference of pleasant and unpleasant odours on executive functioning in male and female young adults.
  4. To assess the difference of pleasant and unpleasant odours on anger in male and female young adults .
- **HYPOTHESES :**
  1. H0: There is no significant impact of pleasant and unpleasant odour on executive function in young adults

     H1 : There is a significant impact of pleasant and unpleasant odour on executive function in young adults
  2. H0 : There is no significant impact of pleasant and unpleasant odour on state and trait anger in young adults .

     H1: There is a significant impact of pleasant and unpleasant odour on state and trait anger in young adults .
  3. H0 : There is no significant difference of pleasant and unpleasant odour on the male and female in terms of executive functioning .

     H1 : There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of executive functioning .
  4. H0 : There is no significant difference of pleasant and unpleasant odour on the male and female gender in terms of state and trait anger .

     H1 : There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of state and trait anger .

- **VARIABLES :**

  The variables used in this research are executive functioning and state and trait anger and pleasant and unpleasant odour .

  - Independent Variable :

  — Unpleasant odour : Turpentine oil, also known as spirits of turpentine, is a colourless , fast-evaporating liquid with a distinct, pungent odour. It is flammable and is obtained by distilling pine sap.

  — Pleasant odour : Citrus essential oil is also the most popular of natural essential oils. The oil is commercially used for food flavourings , toiletry products, cosmetics, perfumes, and so forth. Recently, citrus essential oil has been known not only for its pleasant aromatic functions, but also for its physiological properties, such as chemoprevention against cancer and aromatherapy effects .

  - Dependant Variable :

  — Executive function refers to a complex set of processes that manage and control other functions. Executive function includes cognitive, emotional, and motor abilities, including the ability to self-monitor, plan, organize, reason, be mentally flexible, and problem-solve. It guides how people organize their lives, plan, and implement their plans.

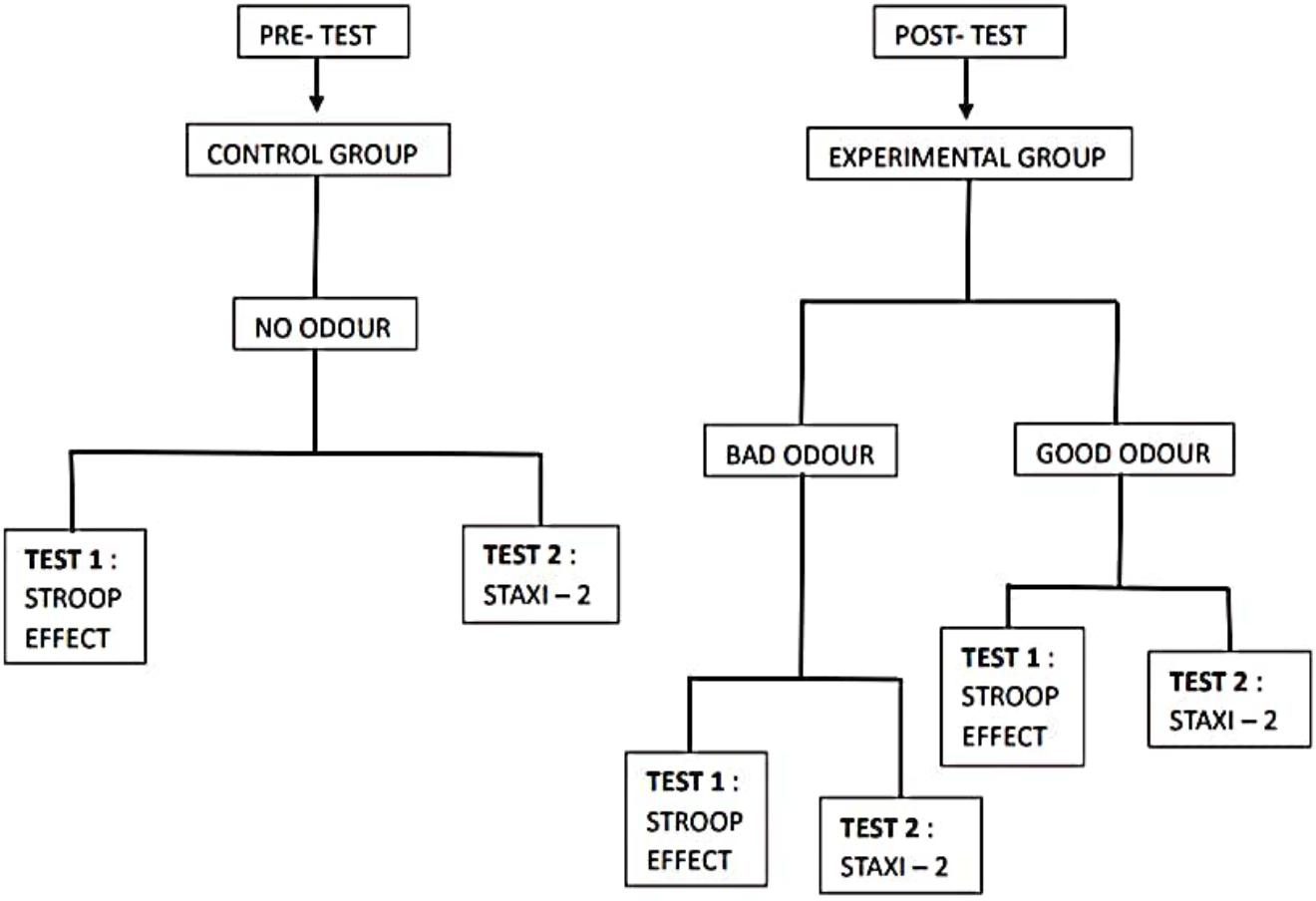
  — State of feeling angry is a universal transitory condition consisting of subjective feelings of anger that vary in intensity and duration and produces physiological reactivity that increases along with the intensity of subjective anger feelings. Trait anger is postulated to be an enduring personality type that predisposes an individual to more frequent anger episodes than individuals who are not high in trait anger .

- **RESEARCH DESIGN :**

  The study follows an experimental pre-test and post-test control group design to explore the impact of pleasant and unpleasant odour on executive functioning and anger across genders. Participants are divided into two groups:

  1. Control Group: No odour exposure (neutral condition)
  2. Experimental Group: Exposed to bad odour first, followed by good odour

Both groups undergo pre-test assessments, followed by the intervention (odour exposure for the experimental group), and then post-test assessments.



- **TOOLS OF RESEARCH :**

General Health Questionnaire :

The GHQ-28 was developed by Goldberg and Hillier in 1979 and is based on an exploratory factor analysis (EFA) of the original GHQ-60. The General Health Questionnaire – 28 (GHQ-28) is self-report screening measure used to detect possible psychological disorder. The GHQ-28 consists of 28 questions designed to identify whether an individual's current mental state differs from his/her typical state. The GHQ-28 identifies two main concerns: (1) the inability to carry out normal functions; and (2) the appearance of new and distressing phenomena .

Scoring - The individual is asked to rate how he/she feels in relation to each question, according to the following criteria: better than usual , same as usual ,worse than usual, much worse than usual . Soring method attributes a binary score system of 0 to the first and second response options (better than usual, same as usual) and a score of 1 to the third and fourth response options (worse than usual, much worse than usual).

State -Trait Anger Expression Inventory– 2 (STAXI -2):

The 57-item Staxi-2 developed by Spielberger, 1996 is a self-report instrument designed to evaluate anger in a psychological context, and to measure how the multiple dimensions of anger affect physical health. The STAXI-2 measures State Anger (a psychological and physiological response to feeling unfairly treated, feeling frustrated, or being attacked) and Trait Anger (a person's disposition or tendency to perceive situations as unfair, frustrating, or as an attack, and to respond to this with increased state anger . In addition to State Anger and Trait Anger , STAXI – 2 also measures Anger Expression-In and Anger Expression Out (expressing or suppressing angry feelings, respectively), and Anger Control-Out (control of angry feelings by preventing their expression. It also introduces a new scale, Anger Control-In (controlling suppressed anger through calming oneself when angry). The STAXI-2 "assesses either the intensity of individuals anger at a particular time or how frequently anger is experienced, expressed, suppressed, or controlled" . The STAXI-2 takes about 12-15 minutes to complete. It is available in several languages.

Scoring - The STAXI-2 yields scores for 6 scales, 5 subscales, and the Anger Expression Index. The items comprising each scale and subscale are as follows:

State Anger scale. Items 1 to 15 comprise the S-Ang scale and subscales. The items comprising each S-Ang subscale are as follows:

Feeling Angry (S-Ang/F): Items 1, 2, 3, 6, and 10.

Feel like Expressing Anger Verbally (S-Ang/V): Items 4, 9, 12, 13, and 15.

Feel like Expressing Anger Physically (S-Ang/P): Items 5, 7, 8, 11, and 14.

Trait Anger scale. Items 16 to 25 comprise the T-Ang scale and subscales. The items comprising each T-Ang subscale are as follows:

Angry Temperament (T-Ang/T): Items 16, 17, 18, and 21.

Angry Reaction (T-Ang/R): Items 19, 20, 23, 24, and 25.

Anger Expression and Anger Control scales. Each of the Anger Expression (AX-O, AX-I) and Anger Control (AC-O, AC-I) scales consists of 8 items (i.e., Items 26 to 57). The items that comprise each scale are as follows:

Anger Expression-Out (AX-O): Items 27, 31, 35, 39, 43, 47, 51, and 55.

Anger Expression-In (AX-I): Items 29, 33, 37, 41, 45, 49, 53, and 57.

Anger Control-Out (AC-O): Items 26, 30, 34, 38, 42, 46, 50, and 54.

Anger Control-In (AC-I): Items 28, 32, 36, 40, 44, 48, 52, and 56.

Anger Expression Index. The AX Index provides a measure of total anger expression scores based on the AX-O, AX-I, AC-O, and AC-I scales. This index is computed using the following formula:

AX Index = AX-O + AX-I – (AC-O + AC-I) + 48

The constant, 48, is included in the formula to eliminate negative numbers. Possible scores on the AX Index range from 0 to 96.

Stroop Effect :

The Stroop Effect Test was developed by American psychologist John Ridley Stroop and published in 1935 . The stroop effect is one example of cognitive inhibition and the hypothesis of parallel processing. In studies of the stroop effect words are written in different colour inks and subjects are required to name the colour of the ink in which the word is written. The reaction time to name the colour is shortened if the world 'green' for example is written ink, and so on. However, there is interference, that is, a slowing down of reaction time and increase in the errors if the colours represented by the word and the ink disagree. Once an activity becomes automatic it will be repeated simply by directing attentive to the appropriate input. Therefore, when we direct attention to printed words, we read them automatically. The inability to read when the verbal and non verbal information disagree is revealed by the Stroop effect.

Scoring - Stroop Effect scoring involves comparing reaction times and accuracy across two conditions congruent (where the word and ink colour match) and incongruent (where the word and colour do not match). The primary measure is the Stroop Interference Score, calculated by subtracting the average reaction time in the congruent condition from that in the incongruent condition. A higher interference score indicates greater cognitive conflict and difficulty in overriding automatic reading responses.

Additionally, error rates are assessed in each condition, with increased errors in the incongruent trials also reflecting interference. Together, these scores help evaluate selective attention and cognitive control.

- **SAMPLE SIZE :**

  The sample size consists of 30 female participants and 30 male participants living in Kolkata between the ages of 18 to 25 years .

- **SAMPLING METHODS :**

  In this research a probability sampling method was used which is simple random sampling . The type of simple random sampling used is table of random numbers.

- **INCLUSION CRITERIA :**

  — Individuals between the age of 18 to 25 years were included.

  — Individuals who are citizen of India and live in Kolkata were included.

  — The genders male and female were included.

  — Individuals with normal olfactory functioning were included.

  — Individuals with normal executive functioning were included .

- **EXCLUSION CRITERIA :**

  — Individuals with serious psychiatric disorders were excluded .

  — Individuals with serious physical health issues were excluded .

  — Individuals on medications affecting cognitive ability or olfactory senses were excluded .

  — Individuals with a history of substance abuse were excluded .

  — Individuals with severe allergic or respiratory problems were excluded .

  — Individuals with a score of more than 5 in general health questionnaire were excluded .

- **STATISTICS :**

  The following statistics has been used for the research :

  1. Shapiro - Wilk Test : Test of Normality

2. Mann Whitney U test : A non – parametric alternative of t test which can be applied to both continuous and discrete measurement variables , irrespective of normality or non – normality of distributions in population and also to very small samples .
3. Descriptive Statistics – The process of summarizing numerical and categorical data in a concise and informative manner .
4. Kruskal Wallis - A non-parametric method of one way Anova for finding the significance of difference between the observations of two or more groups at a time .

- **PROCEDURE :**

Adults from the age of 18 to 25 years made up the sample population . The individuals were seated comfortably in a quiet environment and provided with a screening test general health questionnaire .Once the individuals who scored above 5 in general health questionnaire were selected the research was further divided into control condition and experimental condition . In the control condition Stroop effect and Staxi – 2 were administered without introducing any odour , then in the experimental condition the first odour introduced was bad odour which was taken as turpentine for this research and the tests were repeated , the second odour introduced was the good odour which was a citrus essence and the repetition of the test occurred once more . Through this process the data was collected from 30 male and 30 female individuals . Following the collection of responses from both males and females each response was scored in accordance with the scoring guidelines . A Shapiro Wilk test was used for testing normality , followed by Kruskal Wallis to compare the two independent groups based on gender and the two conditions control and experimental. Then Mann Whitney U test was done to determine significance of differences in the two conditions . The means and standard deviation of all the data were collected .

RESULTS

The calculated statistics are Mean , Standard Deviation , Shapiro Wilk test , Kruskal Wallis and Mann Whitney U test .The numerical of the tested data are given below in a tabular form:

Table 1.1 : Shows the mean and standard deviation (SD) of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the control group condition with no smell . (Total N = 60)

VARIABLES	MALE (N=30)			FEMALE (N=30)		
	MEAN	S.D	SKEWNESS	MEAN	S.D	SKEWNESS
STATE ANGER	18.967	5.075	1.964	20.200	6.830	1.920
TRAIT ANGER	15.533	3.748	0.750	18.433	4.747	0.757
GENERAL ANGER	34.000	11.723	0.575	36.733	9.184	0.611
CONGRUENCE	0.000	0.000	0.000	0.000	0.000	0.000
INCONGRUENCE	1.033	1.159	1.070	1.667	1.626	0.892

The mean values of female participants have shown higher levels for state anger (20.200) , trait anger (18.433) and general anger (36.733) compared to their male counterparts which indicates a consistently elevated anger profile in females under the control group condition with no odour. Regarding the executive function measured through the stroop effect , both genders showed no difference in congruent conditions . However in incongruent trials of stroop effect females showed a higher score (1.667) than males suggesting slower executive functioning in females in absence of any olfactory stimuli .

Table 1.2 : Shows the mean and standard deviation (SD) of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the experimental group condition with bad odour . (Total N = 60)

VARIABLES	MALE (N=30)			FEMALE (N=30)		
	MEAN	S.D	SKEWNESS	MEAN	S.D	SKEWNESS
STATE ANGER	18.300	4.684	1.727	19.367	6.289	1.778
TRAIT ANGER	15.600	4.031	2.050	18.733	5.407	0.392
GENERAL ANGER	34.733	11.700	0.003	35.667	10.623	0.356
CONGRUENCE	0.000	0.000	0.000	0.000	0.000	0.000
INCONGRUENCE	1.933	1.048	0.718	1.633	1.426	1.164

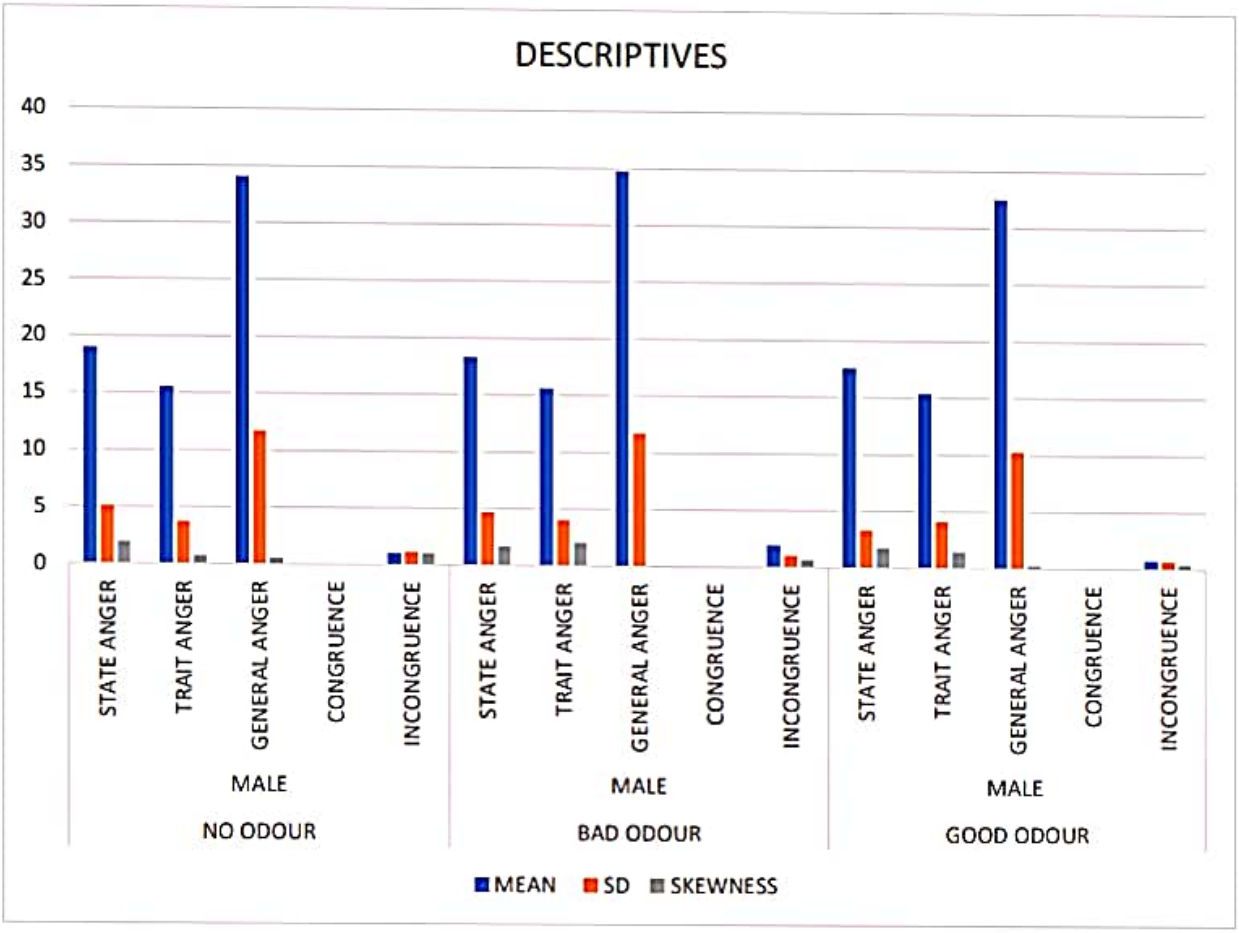
The mean values of female participants have shown higher levels for state anger (19.367), trait anger (18.733) and general anger (35.667) compared to their male counterparts which indicates a consistently elevated anger profile in females under the experimental group condition with bad odour . Regarding the executive function measured through the stroop effect , both genders showed no difference in congruent conditions . However in incongruent trials of stroop effect males showed a higher score (1.933) than females suggesting slower executive functioning in males in presence of an unpleasant olfactory stimuli .

Table 1.3 : Shows the mean and standard deviation (SD) of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the experimental group condition with good odour . (Total N = 60)

VARIABLES	MALE (N=30)			FEMALE (N=30)		
	MEAN	S.D	SKEWNESS	MEAN	S.D	SKEWNESS
STATE ANGER	17.600	3.359	1.806	18.667	5.333	1.555
TRAIT ANGER	15.400	4.116	1.451	18.767	4.539	-0.051
GENERAL ANGER	32.500	10.258	0.294	38.367	10.880	0.525
CONGRUENCE	0.000	0.000	0.000	0.000	0.000	0.000
INCONGRUENCE	0.767	0.728	0.396	1.367	1.189	0.538

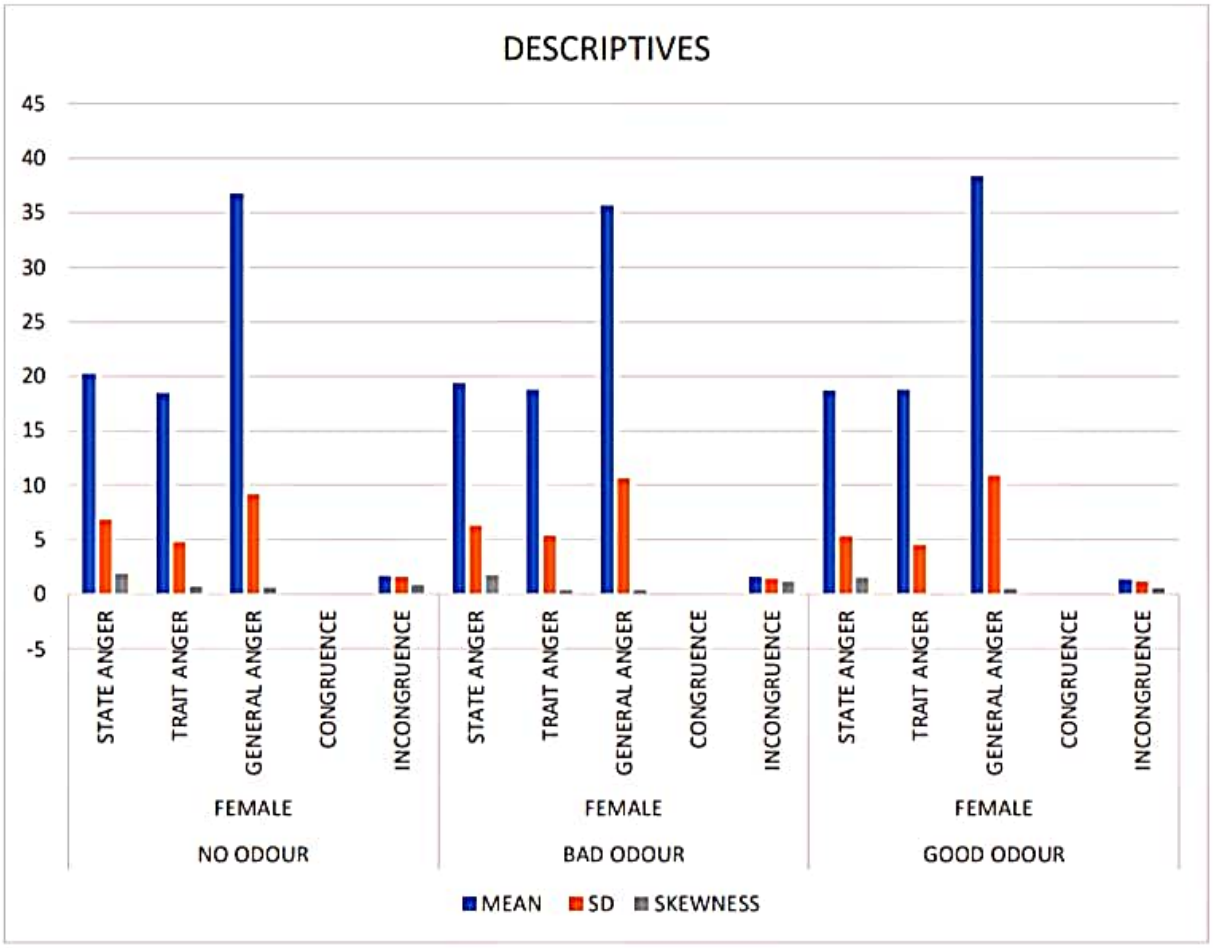
The mean values of female participants have shown higher levels for state anger (18.667), trait anger (18.767) with a significant higher mean value in general anger (38.367) compared to their male counterparts which indicates a consistently elevated anger profile in females under the experimental group condition with good odour . Regarding the executive function measured through the stroop effect , both genders showed no difference in congruent conditions . However in incongruent trials of stroop effect females showed a higher score (1.367) than males suggesting higher executive functioning in males in presence of a pleasant olfactory stimuli.

GRAPH – 1



The mean and standard deviation (SD) of State Trait Anger Inventory – 2 including state anger, trait anger and general anger and Stroop Effect including congruence and incongruence for male (N=30) based on the control group condition with no odour, and experimental group condition including bad odour and good odour in a graphical representation .

GRAPH – 2



The mean and standard deviation (SD) of State Trait Anger Inventory – 2 including state anger, trait anger and general anger and Stroop Effect including congruence and incongruence for female (N=30) based on the control group condition with no odour , and experimental group condition including bad odour and good odour in a graphical representation .

TABLE 2 : Shows the Test of Normality for State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the control group condition and experimental group condition with no odour, bad odour and good odour . (Total N = 60)

VARIABLES	CONDITION	STATISTIC	SIGNIFICANCE
STATE ANGER	NO ODOUR	0.764	0.000
	BAD ODOUR	0.730	0.000
	GOOD ODOUR	0.736	0.000
TRAIT ANGER	NO ODOUR	0.935	0.003
	BAD ODOUR	0.911	0.000
	GOOD ODOUR	0.948	0.013
GENERAL ANGER	NO ODOUR	0.972	0.182
	BAD ODOUR	0.983	0.576
	GOOD ODOUR	0.983	0.558
CONGRUENCE	NO ODOUR	0	0
	BAD ODOUR	0	0
	GOOD ODOUR	0	0
INCONGRUENCE	NO ODOUR	0.824	0.000
	BAD ODOUR	0.881	0.000
	GOOD ODOUR	0.843	0.000

The above table 2 represents the results of the Test of Normality for variables State Anger, Trait Anger, General Anger, Congruence, and Incongruence across three conditions 'No Odour', 'Bad Odour', and 'Good Odour'. Based on the significance values (p-values), it is observed that most of the variables do not follow a normal distribution, as their p-values are less than 0.05. Specifically, State Anger under all three smell conditions significantly deviate from normality ($p = 0.000$). Similarly, Trait Anger in the Bad Odour condition ($p = 0.000$) and No Odour condition ($p = 0.003$) also deviate significantly from normality. However, Trait Anger in the Good Odour condition ($p = 0.013$) is marginally above the 0.01 level but still below 0.05, indicating a slight deviation. General Anger across all conditions ($p < 0.05$) follows a normal distribution. The Congruence variable does not have any kind of significance. In contrast, Incongruence under all conditions shows significant deviation from normality ($p = 0.000$). Thus, most variables do not meet the assumption of normality, with General Anger being a notable exception.

TABLE 3 : Shows the Kruskal Wallis test of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the control group condition and experimental group condition with no odour , bad odour and good odour . (Total N = 60)

VARIABLES	CONDITION	MEAN RANK	STATISTIC	SIGNIFICANCE
STATE ANGER	NO ODOUR	98.07	2.216	0.330
	BAD ODOUR	88.78		
	GOOD ODOUR	84.66		
TRAIT ANGER	NO ODOUR	90.63	0.001	0.999
	BAD ODOUR	90.32		
	GOOS ODOUR	90.56		
GENERAL ANGER	NO ODOUR	90.73	0.004	0.998
	BAD ODOUR	90.16		
	GOOD ODOUR	90.61		
CONGRUENCE	NO ODOUR	90.50	0.000	1.000
	BAD ODOUR	90.50		
	GOOD ODOUR	90.50		
INCONGRUENCE	NO ODOUR	85.02	11.034	0.004**
	BAD ODOUR	107.68		
	GOOD ODOUR	78.81		

**p<0.01

The findings revealed the 'no odour' condition has a higher mean rank for the factors state anger (98.07),trait anger (90.63) and general anger (90.73) which indicates the odour conditions did not have a major effect on the participants anger levels .

The odour condition also did not have any major effects on congruence as all three mean rank for the smell conditions are same .

But, the odour condition consisting of bad odour showed a significant effect on incongruence showing the highest mean rank (107.68) , this can imply that the unpleasant odour may disrupt and potentially impact executive functioning . The level of significance for the incongruence variable is highly significant (0.004) which indicates executive functioning is significantly affected by an olfactory stimuli . Thus the null hypothesis number 3 is rejected.

TABLE 4.1 : Shows the Mann Whitney U test of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the control group condition with no odour. (Total N = 60)

VARIABLES	GENDER	MEAN RANK	STATISTIC	SIGNIFICANCE
STATE ANGER	MALE	30.08	437.500	0.851
	FEMALE	30.92		
TRAIT ANGER	MALE	24.68	275.500	0.10
	FEMALE	36.32		
GENERAL ANGER	MALE	28.37	386.000	0.344
	FEMALE	32.63		
CONGRUENCE	MALE	30.50	450.000	1.000
	FEMALE	30.50		
INCONGRUENCE	MALE	27.20	351.000	0.127
	FEMALE	33.80		

In table 4.1 the Mann-Whitney U test results revealed no statistically significant gender differences across the variables in the control group condition with no odour condition . For state anger, the mean ranks for males (30.08) and females (30.92) were almost similar , with a non-significant value (0.851) . Trait anger showed a higher mean rank for females (36.32) than males (24.68), with a non-significant value (0.10) . Similarly, general anger had a slightly higher mean rank for females (32.63) compared to males (28.37), with a non-significant value (0.344). In the Stroop effect scores, congruence has equal mean ranks for both genders (30.50), indicating no significance with a value of 1.000 . Incongruence showed higher scores in females (mean rank = 33.80) compared to males (mean rank = 27.20), but does not have a statistically significant value (0.127) . Overall, none of the variables showed a significant gender-based difference under the no-odour condition. Thus the null hypothesis number 4 is accepted .

TABLE 4.2 : Shows the Mann Whitney U test of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the experimental group condition with bad odour . (Total N = 60)

VARIABLES	GENDER	MEAN RANK	STATISTIC	SIGNIFICANCE
STATE ANGER	MALE	30.12	438.500	0.860
	FEMALE	30.88		
TRAIT ANGER	MALE	24.97	284.000	0.014**
	FEMALE	36.03		
GENERAL ANGER	MALE	30.02	435.500	0.830
	FEMALE	30.98		
CONGRUENCE	MALE	30.50	450.000	1.000
	FEMALE	30.50		
INCONGRUENCE	MALE	33.33	365.000	0.188
	FEMALE	27.67		

**$p<0.01$

In Table 4.2 the Mann-Whitney U test results indicate that there is a statistically significant gender difference in trait anger which is highly significant (0.014) , and the mean rank of female (36.03) participants are significantly higher than mean rank of males (24.97) under the experimental condition with bad odour. Thus the null hypothesis number 4 is partially rejected. As no significant gender differences were found in state anger , general anger , stroop effect congruence, and incongruence scores , as all significance values exceed 0.05 . These values indicate that exposure to a bad odour may influence trait anger more prominently in females compared to males, while other variables remain unaffected .

TABLE 4.3 : Shows the Mann Whitney U test of State Trait Anger Inventory – 2 score which includes state anger , trait anger and general anger and Stroop Effect score which includes congruence and incongruence for male (N=30) and female (N=30) based on the experimental group condition with good odour. (Total N = 60)

VARIABLES	GENDER	MEAN RANK	STATISTIC	SIGNIFICANCE
STATE ANGER	MALE	31.23	428.000	0.734
	FEMALE	29.77		
TRAIT ANGER	MALE	23.73	247.000	0.003**
	FEMALE	37.27		
GENERAL ANGER	MALE	25.97	314.000	0.044*
	FEMALE	35.03		
CONGRUENCE	MALE	35.50	450.000	1.000
	FEMALE	35.50		
INCONGRUENCE	MALE	26.22	321.500	0.046*
	FEMALE	34.78		

**p<0.01 *p<0.05

In table 4.3 the results of the Mann-Whitney U test indicate significant gender differences in the trait anger , general anger and incongruence variables under the good odour condition. For trait anger, females (37.27) had a significantly higher mean rank than males (23.73) , with a significance value of 0.003 , which is highly significant suggesting higher trait anger in females. Similarly in general anger females have higher mean rank (35.03) compared to males (25.97) , with a significant value (0.044). A significant difference was also observed in the incongruence scores, with high mean rank in females (34.78) than in males (M = 26.22) , with a significant value (0.046) . However, no significant gender differences were found for variables state anger (0.734) and congruence (1.000) . Thus it can be said the null hypothesis number 3 and 4 are rejected .

SUMMARY OF THE RESULT

1. **Hypothesis 1:** Effect of Odour on Executive Function in Young Adults

   There is a significant effect of pleasant and unpleasant odour on executive function in young adults . Stroop Effect showed no significant difference in congruent conditions across all smell exposures (no odour, bad odour, good odour).However, a significant difference was observed in incongruent conditions under the bad odour condition. Kruskal-Wallis test indicated that incongruence scores were highest under the bad odour condition (mean rank 107.68), showing a significant value ($p = 0.004$).It explains that unpleasant odours impair executive functioning, specifically attention and inhibitory control.

2. **Hypothesis 2:** Effect of Odour on State and Trait Anger in Young Adults

   There is no significant effect of pleasant and unpleasant odour on state and trait anger in young adults . State anger and trait anger scores showed minimal differences between odour conditions. Across no odour, bad odour, and good odour conditions, mean ranks for state and trait anger did not vary significantly (Kruskal-Wallis p-values > 0.05). Pleasant and unpleasant odours did not substantially affect anger levels, although females consistently showed higher anger levels across all conditions. Olfactory exposure did not significantly influence state or trait anger in young adults overall.

3. **Hypothesis 3:** Gender Differences in Executive Functioning under Odour Exposure

   No significant gender difference was observed in the no-odour control condition (Mann-Whitney U $p = 0.127$).Under bad odour exposure, males performed worse in incongruent Stroop trials (mean = 1.933) compared to females (mean = 1.633), although this difference was not statistically significant ($p = 0.188$).Under good odour, females showed significantly higher incongruence scores (mean = 1.367) compared to males (mean = 0.767) with a statistically significant result ($p = 0.046$). There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of executive functioning . Gender differences in executive functioning emerged only under pleasant odour condition, with females exhibiting slower response in executive functioning.

4. **Hypothesis 4:** Gender Differences in Anger under Odour Exposure

   In no odour condition, no significant gender differences in anger scores were noted. Under bad odour, trait anger in females was significantly higher ($p = 0.014$) than in males. Under good odour, trait anger ($p = 0.003$), general anger ($p = 0.044$), and incongruence ($p = 0.046$) were all significantly higher in females. There is a significant difference of pleasant and unpleasant odour on the male and female gender in terms of state and trait anger . Females consistently reported higher anger levels particularly trait anger under both pleasant and unpleasant odour exposure.

DISCUSSION

The purpose of the current study was to investigate how both pleasant and unpleasant odours affect executive functioning as well as state and trait anger in both genders. With a special emphasis on gender-specific responses, the findings offer a thorough understanding of the connection between odour, cognition, and emotional reactivity.

According to the Stroop effect scores in the incongruence variable, one of the main conclusions of the study was that odour, particularly unpleasant odour, had a statistically significant impact on executive functioning. Participants exposed to the unpleasant odour (turpentine) showed noticeably higher incongruence scores on the Kruskal-Wallis test ($p = 0.004$), indicating slower executive functioning and impaired cognitive control. According to previous research, unpleasant olfactory stimuli can function as environmental stressors that impair cognitive functions like inhibition and attention (Matthias Hoenen et al., 2020; Ana Fagundo, 2023).

The introduction of a pleasant odour (citrus) appeared to improve executive functioning, especially in male participants, whereas a bad odour more obviously interfered with executive functioning in males. This is consistent with research by Pooja Agarwal et al. (2022), who observed that citrus essential oils have calming and cognitive-enhancing qualities. Improved cognitive flexibility and inhibitory control, particularly in males, are suggested by the lower incongruence scores under pleasant odour conditions.

According to the Kruskal-Wallis test, the study found no evidence of a significant overall impact of olfactory conditions on state or general anger. This somewhat goes against previous research by Robert A. Baron (2010), who found that smells could influence aggressive behaviour. The intensity or length of olfactory exposure in the current study, however, might not have been enough to elicit a strong emotional response in every participant, which could account for this disparity.

However, responses were clearly gender-specific. Under both good and bad smell conditions, females consistently displayed higher levels of trait anger than males; significant differences were noted ($p = 0.003$ for good odour and $p = 0.014$ for bad odour). Due to neurobiological variations in emotion regulation and olfactory processing pathways, this may indicate that females are more sensitive or reactive to olfactory stimuli in emotional contexts (Ute Wallrabeck-Dworschak et al., 2023; Croy Ilona et al., 2016). Furthermore, under the pleasant

odour condition, there was a significant gender difference in general anger ($p = 0.044$), with females scoring higher.

While males showed greater variability in cognitive performance, females generally showed higher anger scores and were more emotionally impacted by both types of odours across all conditions. Notably, the results of the Mann-Whitney U test showed that females had higher cognitive interference (incongruence scores) and males performed better on executive function tasks when the odour was pleasant ($p = 0.046$). This could be a result of gender differences in coping strategies or emotional processing styles. Hormonal, neurological, and psychosocial factors may also play a role in these gendered disparities (Smiljana Mutic et al., 2016; Sarah Holley et al., 2017).

These results contribute to the increasing amount of evidence that olfactory stimuli can affect emotion and cognition, in intricate and occasionally gender-specific ways. The evident effect that disagreeable smells have on executive functioning emphasises the importance of sensory considerations in settings where cognitive function is crucial.

Furthermore, the higher anger scores in women under different circumstances may indicate a higher susceptibility to affective disruptions associated with environmental cues. This has consequences for therapies that try to control emotional dysregulation, particularly in female populations, and may use pleasurable scents for therapeutic or calming effects.

The anatomical closeness and interaction of the olfactory bulb, orbitofrontal cortex, hippocampus, and amygdala form the neurological basis of the relationship between olfactory perception, cognition, and emotion. Odours can function as emotional triggers, cognitive modulators, and environmental cues due to these interconnected regions. Odor-evoked memories and emotions can be strong and frequently unconscious, according to studies (e.g., de Araujo et al., 2005; Willander & Larsson, 2007), which may have an impact on executive functioning and behavioural reactions.

The idea that pleasant scents can support higher cognitive processes by stimulating orbitofrontal regions of the brain, which are essential for executive function, is further supported by Ana B. Fagundo's investigation of the connection between smell and the

prefrontal cortex. According to research by Rolls et al., the orbitofrontal cortex also processes hedonic valence, highlighting the scents dual emotional and cognitive effects.

According to Robert A. Baron's (2010) research, pleasant scents may lessen aggression in people who are not provoked, suggesting that situational anger is moderated by olfactory pleasantness rather than innate trait anger. While pleasant odours may temporarily reduce emotional reactivity, they may not significantly change ingrained anger traits, especially in females who consistently displayed higher scores. This nuance may help to explain why state anger was not significantly different between genders under good odour conditions.

Increased anger is associated with worse odour identification, according to Matthias Hoenen et al. This suggests that emotional states can influence olfactory processing and may lessen the cognitive benefit that pleasant odours provide to people with higher trait anger.

Pleasant odours may temporarily reduce emotional reactivity and have a positive impact on executive functioning, especially in men. They seem to have little impact on ingrained trait anger, though, particularly in women. These results highlight the therapeutic potential of olfactory stimuli in regulating cognition and emotion, but they also warn against exploring their advantages to all people and their personality types.

CONCLUSION

The study is based on gender differences aimed to examine how pleasant and unpleasant odours affected young adults executive function as well as their state and trait anger. Using a pre-test post-test control group design and administering standardised psychological tests such as the Stroop Effect Test and STAXI-2, the results provide insight into the complex relationship between olfactory stimuli and cognitive-emotional processing.

According to the study's findings, olfactory stimuli have a major impact on executive functioning, especially when unpleasant odours are present. This impairs performance, as shown by higher Stroop incongruence scores. While female participants consistently showed higher levels of trait and general anger across all conditions, including exposure to pleasant odours, male participants showed some improvement in executive function when exposed to pleasant odours. Although pleasant odours may improve cognitive function and slightly alter emotional reactivity, they do not significantly lessen ingrained emotional traits like trait anger, according to gender-based differences in reaction to olfactory conditions. Overall, the results underline the potential of olfactory stimuli as a modulating factor in executive function and emotional expression, especially when taking gender differences into account. They also support a relationship between odour, cognition, and emotion.

According to the findings, executive functioning was significantly impacted by unpleasant odours, especially when they were present, but anger levels were not significantly affected by either pleasant or unpleasant odours across conditions (state, trait, or general anger). Particularly, the bad odour condition led to a significant increase in incongruence scores on the Stroop Effect Test, indicating a disruption in executive functioning traits such as cognitive control and attentional processes. This lends to the idea that olfactory input, especially unpleasant ones, can affect executive function, perhaps as a result of emotional distraction or increased cognitive load.

Additionally, gender differences were noted, especially in reaction to odour conditions. There were statistically significant differences in trait and general anger under both the bad and good odour conditions, and female participants consistently showed higher mean values for state, trait, and general anger across conditions. Males performed better in the incongruent Stroop

condition when exposed to pleasant odours in terms of executive function, suggesting that gender may play a role in resilience or responsiveness to positive olfactory stimuli.

Overall, the study confirms that, with subtle differences between genders, olfactory stimuli can modulate aspects of emotional reactivity and cognitive performance. These results underline the potential of olfactory interventions in managing cognitive-emotional outcomes in everyday and clinical settings, and they add to the increasing body of evidence that links sensory perception with executive control and emotional regulation .

LIMITATIONS OF THE STUDY :

- Small size of sample (N=60) limits generalizability to larger populations.
- Time constraint , due to the limited time period provided for conducting the research .
- Geographic restriction , as participants are only from Kolkata which may not reflect broader cultural or environmental influences.
- Age restriction (18–25 years), which eliminates effects on other age groups, particularly older adults or children.
- The effects of odours may not be reflected in short-term exposure to olfactory stimuli.
- Beyond screening for normal function, there was little control over potential individual differences in olfactory sensitivity.
- Although they were not taken into consideration, pre-test emotional states may have an impact on Stroop and anger test results.
- Individual perception and the intensity of olfactory stimuli may vary, and objective measurements were not used to standardise them.
- No physiological measurements, such as cortisol or heart rate, were made to confirm psychological reactions.
- Non-binary identities were not included in the gender comparison, which was restricted to binary categories.
- Insufficient long-term monitoring to determine whether odor-induced alterations in anger or executive function endure.

APPLICABILITY OF THE STUDY :

- Helpful in creating aromatherapy treatments meant to manage anger or enhance executive functioning.
- Can use fragrance to direct the design of environments (such as therapy rooms and classrooms) to enhance cognitive function.
- Provides a foundation for studies on olfactory responses based on gender, encouraging investigation of neurobiological variations.
- Promotes more research that combines psychological testing and physiological data to confirm the effects of odour.
- The potential for therapeutic scent-based approaches to be extended to clinical populations (such as those with PTSD, depression, or ADHD).

- Draws attention to how cognition and sensory perception interact, which can help guide cognitive neuroscience.
- Can guide the creation of fragrances and products for healthcare, education, and wellness.
- Encourages the creation of instruments or technologies that use olfactory cues to alter behaviour or concentration.

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APPENDICES

APPENDIX I

INFORMED CONSENT :

Purpose of the Dissertation : This Dissertation is being conducted as a part of the post graduate course in Applied Psychology in Sister Nibedita University . The purpose of the work is to study the effect of odour on executive functioning and negative impact on male and female young adults of Kolkata .

What You Will Be Asked to do in the Research : If you volunteer to participate, you will be exposed to two types of smell one pungent and one pleasant and answer the questions of some questionnaire and participate in a simple test . Your answers will not be judged on the basis of right and wrong. The answer of each individual will only be analysed to arrive at the research result .

Risks and Discomforts : The smells that you are being exposed to can become a source of discomfort, if such a thing happens inform me as soon as possible so proper measures could be taken .

Benefits of the Research and Benefits to You : This study will not bring you specific benefits outside of an opportunity to share your views and opinions. Your participation, however, will be of considerable benefit solely for the purpose of research and advancement of knowledge in the field.

Voluntary Participation : Your participation in the study is completely voluntary, and you may refuse to answer any question , refuse to smell the odour or choose to stop participating at any time without any penalty. Your decision not to volunteer will not influence your relationship with the researcher .

Confidentiality : All information you supply during the research will be held in confidence and, unless you specifically indicate your consent, your name will not appear in any report or publication of the research. Your data will be safely stored in a locked facility, and only the researcher will have access to this information. Confidentiality will be provided to the fullest extent .

I consent to participate in this study .

Signature –

Date -

APPENDIX II

SOCIO-DEMOGRAPHIC DETAILS :

• Name –

• Age –

• Gender –

• Sex -

• Occupation –

• Father's age –

• Father's occupation –

• Mother's age –

• Mother's occupation –

• Educational Qualification –

• Class XII percentage –

• Address –

• Religion –

• Family size –

• Family income –

• Mother tongue –

• Any physical diseases/head injury/disabilities – Yes / No

If yes specify –

APPENDIX III

Please read this carefully: We would like to know if you had any medical complaints, and how your health has been in general, over the past few weeks. Please answer all the questions on the following pages simply by underlining the answer which you think most nearly applies to you. Remember that we want to know about present and recent complaints, not those that you had in the past. It is important that you try to answer all the questions. Thank you very much for your co-operation.

Have you recently :

1.Been feeling perfectly well and in good health ?	Better than usual	Same as usual	Worse than usual	Much more than usual
2.Been feeling in need of a good tonic ?	Not at all	No more than usual	Rather more than usual	Much more than usual
3.Been feeling run down and out of sorts ?	Not at all	No more than usual	Rather more than usual	Much more than usual
4.Felt that you are ill?	Not at all	No more than usual	Rather more than usual	Much more than usual
5.Being getting any pains in your head ?	Not at all	No more than usual	Rather more than usual	Much more than usual
6.Been getting a feeling of tightness or pressure in your head ?	Not at all	No more than usual	Rather more than usual	Much more than usual
7.Been having hot or cold spells ?	Not at all	No more than usual	Rather more than usual	Much more than usual
8.Lost much sleep over worry ?	Not at all	No more than usual	Rather more than usual	Much more than usual
9.Had difficulty in staying asleep once you are off ?	Not at all	No more than usual	Rather more than usual	Much more than usual
10.Felt constantly under strain?	Not at all	No more than usual	Rather more than usual	Much more than usual
11.Been getting edgy and bad tempered ?	Not at all	No more than usual	Rather more than usual	Much more than usual

12. Been getting scared or panicky for no good reason ?	Not at all	No more than usual	Rather more than usual	Much more than usual
13.Found getting everything on top of you ?	Not at all	No more than usual	Rather more than usual	Much more than usual
14.Been feeling nervous and strung up all the time ?	Not at all	No more than usual	Rather more than usual	Much more than usual
15.Been managing to keep yourself busy and occupied ?	More so than usual	Same as usual	Rather more than usual	Much less than usual
16.Been taking longer over the things than you do ?	Quicker than usual	Same as usual	Longer than usual	Much longer than usual
17.Felt on the whole you were doing things well ?	Better than usual	About the same	Less well than usual	Much less than usual
18.Been satisfied with the way you've carried out your tasks ?	More satisfied	About the same	Less satisfied than usual	Much less satisfied than usual
19.Felt that you are playing a useful part in things ?	More so than usual	Same as usual	Rather less than usual	Much less than usual
20.Felt capable of making decisions about the things ?	More so than usual	Same as usual	Rather less than usual	Much less than usual
21.Been able to enjoy your normal day-to-day activities ?	More so than usual	Same as usual	Rather less than usual	Much less than usual
22.Been thinking of yourself as worthless person ?	Not at all	No more than usual	Rather more than usual	Much more than usual
23.Felt that life isn't entirely hopeless ?	Not at all	No more than usual	Rather more than usual	Much more than usual
24.Felt that life isn't worth living ?	Not at all	No more than usual	Rather more than usual	Much more than usual
25.Though of the possibility that you might make away with yourself ?	Definitely not	I don't think so	Has crossed my mind	Definitively have
26.Found at times you couldn't do anything because your nerves were too bad ?	Not at all	No more than usual	Rather more than usual	Much more than usual

27.Found yourself wishing you were dead and away from it all ?	Not at all	No more than usual	Rather more than usual	Much more than usual
28.Found that the idea of taking your own life kept coming into your mind ?	Definitely not	I don't think so	Has crossed much mind	Definitely has

APPENDIX IV

TABLE 1

GREEN

RED

BLACK

GREEN

RED

BLACK

BLUE

BLACK

BLUE

GREEN

RED

BLUE

GREEN

RED

BLACK

BLUE

TABLE 2

BLUE

GREEN

RED

BLUE

BLACK

RED

GREEN

BLACK

GREEN

BLUE

BLACK

RED

BLUE

BLACK

RED

GREEN

APPENDIX V

Everyone feels angry or furious from time to time , but people differ in the ways that they react when they are angry . A number of statements that people use to describe themselves are given below. Read each statement and then tick the appropriate column on the side to indicate how you feel right now. There are no right or wrong answers. Do not spend too much time on any one statement. Mark the answer that best describes your present feelings.

PART I

ITEM NUMBER	ITEM	NOT AT ALL	SOMEWHAT	MODERATELY SO	VERY MUCH SO
1	I am furious				
2	I feel irritated				
3	I feel angry				
4	I feel like yelling at somebody				
5	I feel like breaking things				
6	I am mad				
7	I feel like banging on the table				
8	I feel like hitting someone				
9	I feel like swearing				
10	I feel annoyed				
11	I feel like kicking somebody				
12	I feel like cursing out loud				
13	I feel like screaming				
14	I feel like pounding somebody				
15	I feel like shouting out loud				

PART 2

ITEM NUMBER	ITEM	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
16	I am quick tempered				
17	I have a fiery temper				
18	I am a hot headed person				
19	I get angry when I 'm slowed down by others mistake				
20	I feel annoyed when I am not given recognition for doing good work				
21	I fly off the handle				
22	When I get mad, I say nasty things				
23	It makes me furious when I am criticized in front of others				
24	When I get frustrated, I feel like hitting someone				
25	I feel infuriated when I do a good job and get a poor evaluation				

PART 3

ITEM NUMBER	ITEM	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
26	I control my temper				
27	I express my anger				
28	I take a deep breath and relax				
29	I keep things in				
30	I am patient with others				
31	If someone annoys me, I'm apt to tell him or her how I feel				
32	I try to calm myself as soon as possible				
33	I pout or sulk				
34	I control my urge to express my angry feelings				
35	I lose my temper				
36	I try to simmer down				
37	I withdraw from people				
38	I keep my cool				
39	I make sarcastic remarks to others				
40	I try to soothe my angry feelings				
41	I boil inside, but I don't show it				
42	I control my behaviour				
43	I do things like slam doors				
44	I endeavour to become calm again				
45	I tend to harbour grudges that I don't tell anyone about				
46	I can stop myself from losing my temper				
47	I argue with others				
48	I reduce my anger as soon as possible				
49	I am secretly quite critical of others				
50	I try to be tolerant and understanding				
51	I strike out at whatever infuriates me				
52	I do something relaxing to calm down				
53	I am angrier than I am willing to admit				

54	I control my angry feelings				
55	I say nasty things				
56	I try to relax				
57	I'm irritated a great deal more than people are aware of				